COMPARISON OF DIAGNOSTIC ACCURACY OF CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH, DIGITAL RADIOVISIOGRAPH AND DIGITAL ORTHOPANTOMOGRAPH IN DETECTING INTERDENTAL BONE LOSS

Dissertation submitted to

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfilment for the degree of

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DECLARATION BY THE CANDIDATE

TITLE OF DISSERTATION	COMPARISON OF DIAGNOSTIC ACCURACY OF CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH, DIGITAL RADIOVISIOGRAPH AND DIGITAL ORTHOPANTOMOGRAPH IN DETECTING INTERDENTAL BONE LOSS
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DURATION OF THE COURSE	3 years
NAME OF THE GUIDE	Dr. (Capt) S. Elangovan, M.D.S
HEAD OF THE DEPARTMENT	Dr. (Capt) S. Elangovan, M.D.S

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Date : 18/01/19

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Dedicated to my father ***Mr. K. Chellan****, my mother* ***Mrs. Indira****, my wife* ***Mrs. T. Sindhuja*** *for their care, love, support and prayers to overcome all my hardships and being my constant source of support.*

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INTRODUCTION

The position and shape of the alveolar margins are indices of health and disease to both the general dentist and the periodontist. In examining these, the use of radiographs plays an important diagnostic role. Bjorn, Hailing and Thyberg (1969), who mounted intra-oral radiographs in frames and projected the images onto a back-projection table on which a scale had been drawn. They established bone heights relative to tooth lengths by means of this method. (1)

The development of direct digital radiographic methods has made it possible to reduce the radiation dose and to enhance the image quality after image acquisition. The diagnostic accuracy of direct digital radiography has been shown to be comparable to that of conventional film radiography for the detection of experimental bone tissue lesions. (2)

The shortcomings of film-based radiography, which have been dealt with in previous studies, include processing errors, increased radiation dose in comparison with direct digital images, poor imaging geometry, and lack of post-imaging enhancement facilities. (3)

Along with marginal inflammation, periodontal pocket formation, and attachment loss, alveolar bone loss is a primary feature of periodontitis. The height of the alveolar bone may be evaluated by intrasurgical inspection or, less invasively, by radiographic

examination; however, radiographic assessment tends to underestimate the amount of bone loss. [5]

Alveolar bone loss is the main feature of destructive inflammatory periodontal disease. The height of the alveolar bone may be evaluated by radiographic examination. However, conventional radiographic assessment tends to underestimate the amount of bone loss. Digital measurement with RVG may improve diagnostic interpretation of radiographs in terms of accuracy [7].

Alveolar bone loss is a main characteristic of destructive inflammatory periodontal disease. The height of the alveolar bone may be evaluated by radiographic examination. However, radiographic assessment tends to underestimate the amount of bone loss [8].

Digital radiology was invented because of the need for improvement in diagnostic imaging. The digital system presents features that provide greater dynamism to images, facilitates interpretation and diagnosis of proximal changes. In addition, the accuracy of diagnosis can be enhanced by programs that filter the images. These programs can adjust the brightness and contrast, determine the gray level, inverte the shades of gray, and apply pseudocolors. [9]

The correct diagnosis of periapical lesions by radiographs should be carefully done and the diagnosis will define the treatment choice and prognosis. In addition, the radiographic examination is fundamental to assess the repair or the persistence of post-treatment periapical lesions. (10)

Radiographs have been used in medicine since 1895 when Wilhelm Conrad Roentgen discovered the roentgen rays. One year later, the radiographic technique was used by Morton in the diagnosis of periodontal disease. With the Introduction of the concept of focal infection, radiographs became commonly accepted in dentistry. In periodontics, radiographs have mainly

been used to assess the loss and destruction of alveolar hone and to confirm a clinical diagnosis of trauma from occlusion. Intraoral radiographs are generally preferred due to their sharpness and ability to demonstrate structural details (Barr 1966). (12)

Bone loss has been expressed as a percent of total root length or of total tooth length, and more recently in terms of absolute measurements in millimeters. Low sensitivity for subtle changes is considered to be the major limitation of these conventional interpretations of radiographie images of periodontal bone support. (13)

Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms, resulting in destruction of the gingival, periodontal

ligament and alveolar bone. Progressive loss of alveolar bone is an important feature of periodontal disease. Accurate detection of periodontal disease with the use of radiographs helps in diagnosis, treatment plan and prognosis. Bone loss at the crest of the alveolar bone and interdental osseous defects are the frequent sequelae of periodontal disease.

Diagnosing their presence and establishing their morphology before surgical access requires a careful clinical examination combined with diagnostic quality radiographs [21].

AIMS OF THE STUDY

To compare the diagnostic accuracy of conventional intraoral periapical radiograph, digital radiovisiograph and digital orthopantamograph in detecting interdental alveolar bone loss using digital radiovisiographic measurements as the gold standard.

OBJECTIVE OF THE STUDY

The main objective of this study is to estimate the diagnostic accuracy of conventional intraoral periapical radiographs, digital radiovisiography and digital orthopantomography in detecting interdental alveolar bone loss using digital radiovisiography measurements as the gold standard and to suggest the most accurate technique to be used in the clinical departments.

REVIEW OF LITERATURE

Volchansky et al. (1976)[1] selected radiographic landmarks for measurement purposes; and secondly the determination of the accuracy and reproducibility of intra-oral radiographs taken under standardised conditions. They have concluded that long cone parallel technique ensures reasonably distortion-free intra-oral radiographs; the use of a metal sphere on the film or tooth, indicates whether there is distortion or false magnification of the object or not; and the measuring table onto which the radiographs are projected at predetermined magnification makes it possible to see the landmarks more clearly.

Salonen et al. (1991)[2] conducted a cross-sectional epidemiologic study to assess the interproximal alveolar bone level within the dentition of randomly selected adult individuals, stratified according to gender and age and reduction in mean alveolar bone/root ratio with age. They concluded that women had a significantly more favorable mean alveolar bone height/root length ratio than men in the ages above 40 years.

Maurizio S. Torniti et al. (1993)[3] compared the probing attachment level and radiographic bone linear measurements to a gold standard obtained as intrasurgical clinical measurements at baseline. They have concluded that probing attachment level gain showed better diagnostic accuracy than radiographic bone gain to correctly discriminate bone gain following guided tissue regeneration.

Peter Eickholz et al. (1998)[4] compared radiographic assessment of interproximal bone loss using a Ioupe with a 0.1 mm calibrated grid and a computer-assisted analysis system (LMSRT). They have concluded that the computer-assisted analysis of linear distances on radiographs underestimated the amount of interproximal bone loss significantly less than conventional measurements using a calibrated loupe and, vertical and particularly horizontal angulation differences between the central beam and the orthoradial projection increased the risk of underestimating interproximal bone loss by radiographic examination.

Madhu K. Nair et al. (1998)[5] evaluated the accuracy of alveolar crestal bone detection in a comparison of unenhanced and enhanced Sidexis (Siemens Medical Systems, Inc., Bensheim, Germany) digital images with Ektaspeed Plus (Eastman Kodak, Rochester, N.Y.) films by means of receiver operating characteristic analysis. They concluded that Sidexis digital imaging system was not significantly different from Ektaspeed Plus film for crestal bone evaluation in their in vitro study.

Eickholz et al. (2000)[6] examined the accuracy of linear measurements on radiographs of interproximal bone loss in intrabony defects utilizing the gold standard of surgical measurements. They have concluded that computer-assisted analysis of linear distances on radiographs underestimated the amount of interproximal bone loss as assessed by surgical measurements.

Britta Wolf et al. (2001)[7] assessed the reproducibility and validity of linear measurements of interproximal bone loss in intrabony defects on digitized radiographic images after application of different filters and magnifications. They have concluded that the chosen digital manipulations (filters: spreading, structure) of radiographic images failed to result in significantly more reproducible or valid measurements of interproximal bone loss within intrabony defects when compared to the digitized but unchanged images. All radiographic assessments on the digitized images except for use of enhancement of grey level differences (structure) came close to the intrasurgical gold standard.

A.R. Talaiepour et al. (2005)[8] evaluated the accuracy of RadioVisioGraphy (RVG) in the linear measurement of interproximal bone loss in intrabony defects. They have concluded that radiographic assessment by either the CEJ or occlusal references overestimated bone loss as compared to the intrasurgical gold standard.

Parissis et al. (2005)[9] compared the image quality characteristics of conventional radiographs and their digital counterparts. They have concluded that digitized radiographs appeared to be of higher density than the conventional ones. Moreover, they demonstrated a narrower density range. Resolution was similar for both types of images.

Gang LI et al. (2007)[10] compared the accuracy and precision of marginal bone level measurements in digital radiographs with and without color coding. They concluded

that color-coding digital radiographs with such a color scale that brightness, hue and saturation, as well as the response of the human visual system to light intensities, were taken into account did not affect the accuracy and precision of measurements of marginal alveolar bone levels, neither positively nor negatively, compared to measurements in black-and-white radiographs.

Benedicta K.J. Wong et al. (2007)[11] determined the anatomical variations in the radiographic distance between the cemento-enamel junction and the alveolar crest with respect to ethnic heritage and gender in New Zealand dental students. They demonstrated that within this group of dental students, those of Asian descent had a significantly greater CEJ-AC distance than their non-Asian counterparts by 20 years of age. This finding suggested that these Asians might have had an increased history of periodontal disease.

Rui Vicente Oppermann et al. (2007)[12] conducted a review to identify the presence of periodontal diseases and the relative importance of known risk factors in Latin American countries. The retrieved data were sparse and inconsistent, lacking information for the majority of the countries. They have concluded that periodontal diseases are highly prevalent in Latin American populations.

David L. Cochran et al. (2008)[13] suggested that Interleukin-1 and tumor necrosis factor-alpha, Antigen-stimulated lymphocytes (B and T cells) lead to osteoclastogenesis

and subsequent bone loss via the receptor activator of nuclear factor-kappa B (RANK)–RANK ligand (RANKL)–osteoprotegerin (OPG) axis. Increase in receptor activator of nuclear factor-kappa B ligand mRNA expression and protein production increased the receptor activator of nuclear factor-kappa B ligand/osteoprotegerin ratio and stimulated the differentiation of macrophage precursor cells into osteoclasts. They also stimulated the maturation and survival of the osteoclasts, leading to bone loss.

Ajay Parihar et al. (2010)[14] investigated the accuracy of diagnosing periapical lesions through conventional radiography and direct digital radiography technique. Both the conventional and digital images were taken with the same exposure parameters keeping the film without lead foil and sensor simultaneously. They have concluded that digital images had the highest diagnostic value according to sensitivity.

Farzad Esmaeli et al. (2012)[15] assessed the correlation between indirect digital radiographic measurements and clinical measurements in determining the topography of interproximal bony defects. They have concluded that indirect digital radiographic technique could be used to diagnose intra-osseous defects, providing a better opportunity to treat bony defects and digitized parallel periapical radiographs have a high level of correlation with clinical measurements..

Wilton Mitsunari Takeshita et al (2013)[17] compared the diagnostic accuracy of direct digital radiography, filtered images and subtraction radiography in detecting

proximal defects. They have concluded that digital subtraction radiography was the best method of diagnosis.

Karanprakash Singh et al. (2015)[18] assessed the depth of alveolar bone loss by using conventional radiography (IOPA) and digital radiography (RVG) techniques in periodontitis as it affects the connective tissue attachment and supporting bone around the teeth. They concluded that the digital radiographs had an upper hand when compared to conventional radiographs in terms of alveolar bone loss. Although RVG had superior image recording capabilities compared to conventional radiographs, its cost factor was an important point of consideration, which could limit its use.

Hans R Preus et al. (2015)[19] tested a rapid and indirect, semi-automated radiographic method for periodontal bone level assessments that reduces the distortion of radiographic bone level (RBL) changes caused by varying angles when obtaining the radiographic image. They have concluded that when examining radiographic images for longitudinal changes of the periodontal bone level, the direct technique were markedly biased when the angle between the X-ray beam and the sensor was 30°. This was not observed with the indirect, length-adjusted technique proposed in the present study. Thus the presented, indirect technique seemed to be an appropriate radiographic method for longitudinal measurements of the periodontal bone level.

Ashwinirani et al. (2015)[21] compared the efficacy of conventional intraoral periapical (IOPA) and direct digital radiographs (RVG) in detecting interdental alveolar bone loss using intrasurgical (IS) measurements as the gold standard. They concluded that both the radiographic techniques IOPA and RVG underestimated bone loss by 1.5–2.5 mm. RVG was superior to IOPA for the detection of interdental bone loss due to reduced time and radiation exposure to obtain the same diagnostic information.

Mojdeh Mehdizadeh et al. (2016)[22] compared the accuracy of determining the distance between alveolar crest and cementoenamel junction in digital radiography with two image processing software programs. They have concluded measurements made to determine the distance from the cementoenamel junction to the alveolar crest with Dental Eye and Scanora, relative to each other, and relative to the standard mode, were accurate only on distal surfaces of teeth.

Daniele Lucca Longo et al. (2017)[23] has evaluated the correlation between conventional and digital radiographic methods in the measurement of periapical lesions in primary molars and compared the time used to obtain the radiographic images between both methods. They have concluded that the digital method had a shorter time amount to obtain the images and strong correlation between the lesion measurements than the conventional method, and therefore, the digital radiograph method was preferable for using in children.

MATERIALS AND METHODS:

Study type: Observational study

Study design: Cross-sectional study

Study duration: October 2017 –September 2018

Source of Data collection: The size of the study sample consisted of 50 patients who were randomly selected from the OPD of Department of Oral Medicine and Radiology. in K.S.R dental college, Tamil Nadu, India, between October 2017 to September 2018, after obtaining their informed consent.

INCLUSION CRITERIA:

- Patients who were diagnosed with moderate to severe chronic periodontitis.

EXCLUSION CRITERIA:

- Patients with drifted teeth, supraerupted teeth.
- Those who were contraindicated for any radiographic procedure.
- Supernumerary teeth adjacent to mandibular first molars.
- Three rooted mandibular first molars.
- Patients undergoing orthodontic treatment.
- Patient who refused to participate.

METHODOLOGY:

50 subjects have been enrolled who voluntarily signed an informed consent after obtaining institutional ethical committee clearance. Patients were informed about the objectives of the study and explained about the benefits and risks involved.

Fifty inter-dental sites were considered for the study. The sites included distal surface of the mandibular first molar.

Patients having generalized mild to severe chronic periodontitis as assessed by measuring attachment loss and categorized as mild: 1-2 mm, moderate: 3-4 mm, severe: ≥ 5 mm.

CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH:

A series of conventional intraoral periapical radiographs were taken for each of fifty patients having chronic periodontitis using Confident dental X-ray unit operated at 70 Kvp and 8mA with a radiation exposure of 0.8 seconds using paralleling angle technique. Constant source to object and object to film distance was maintained for all the radiographs.

The film used was Kodak E - speed, number 2 of size 41 x 31 mm (Ekta speed, Eastman Kodak, Rochester, USA) and processing of the film was done manually using visual method.

MEASUREMENT OF BONE LOSS:

Radiographs were mounted on x-ray viewer and alveolar bone loss was measured in the interproximal region between first and second mandibular molars by keeping divider on the Cemento Enamel junction to the most apical level of alveolar bone. Later transparent ruler was used to evaluate the distances between the two points of divider. The bone loss in intraoral

periapical radiographs were measured after blocking the light around the periphery of the film with an opaque paper.

DIGITAL RADIOVISIOGRAPHS:

Similarly a series of digital radiovisiographs were taken for each of fifty patients having chronic periodontitis using Satelec dental X-ray unit operated at 70 Kvp and 8mA with a radiation exposure of 0.2 seconds and SOPIX^2 sensor.

To ensure maximum hygiene, the sensor was covered with plastic sleeves and for each patient a new plastic cover was used.

MEASUREMENT OF BONE LOSS:

The measurement in digital radiovisiographs was done using SOPRA Imaging software – Version 1.71 A. Alveolar bone loss was measured from the Cemento Enamel junction to the most apical level of marginal bone.

DIGITAL ORTHOPANTAMOGRAPH:

Similarly a series of digital orthopantamographs were taken for each of fifty patients having chronic periodontitis using SIRONA dental X-ray unit operated at 64 Kvp and 8mA with a radiation exposure of 14.1 seconds.

To ensure maximum hygiene, the bite block was covered with plastic sleeves and for each patient a new plastic cover was used.

MEASUREMENT OF BONE LOSS:

The measurement in digital orthopantamographs was done using SIDEXIS Imaging software. Alveolar bone loss was measured from the Cemento Enamel junction to the most apical level of marginal bone.

ARMAMENTARIUM:

Intraoral Periapical radiographic film (Film Size 30.5 x 40.5 mm)
Film Holder
Disposable gloves and mouth masks
Divider
Transparent ruler
Disposable plastic sleeves
Position indicating device
Radiovisiography Sensor

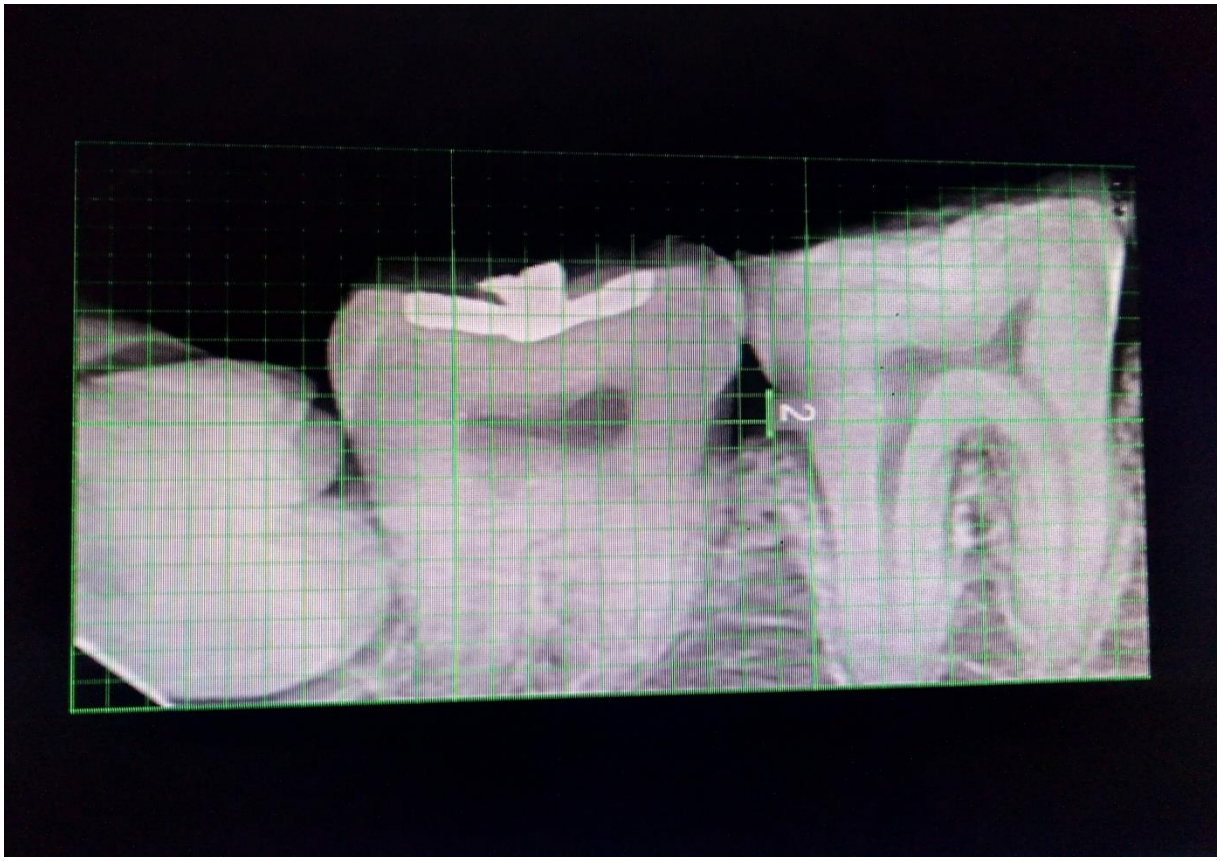
PATIENT POSITIONED FOR CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH

MEASUREMENT OF ALVEOLAR BONE LOSS USING CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH

PATIENT POSITIONED FOR DIGITAL RADIOVISIOGRAPHY

MEASUREMENT OF ALVEOLAR BONE LOSS USING DIGITAL

RADIOVISIOGRAPHY



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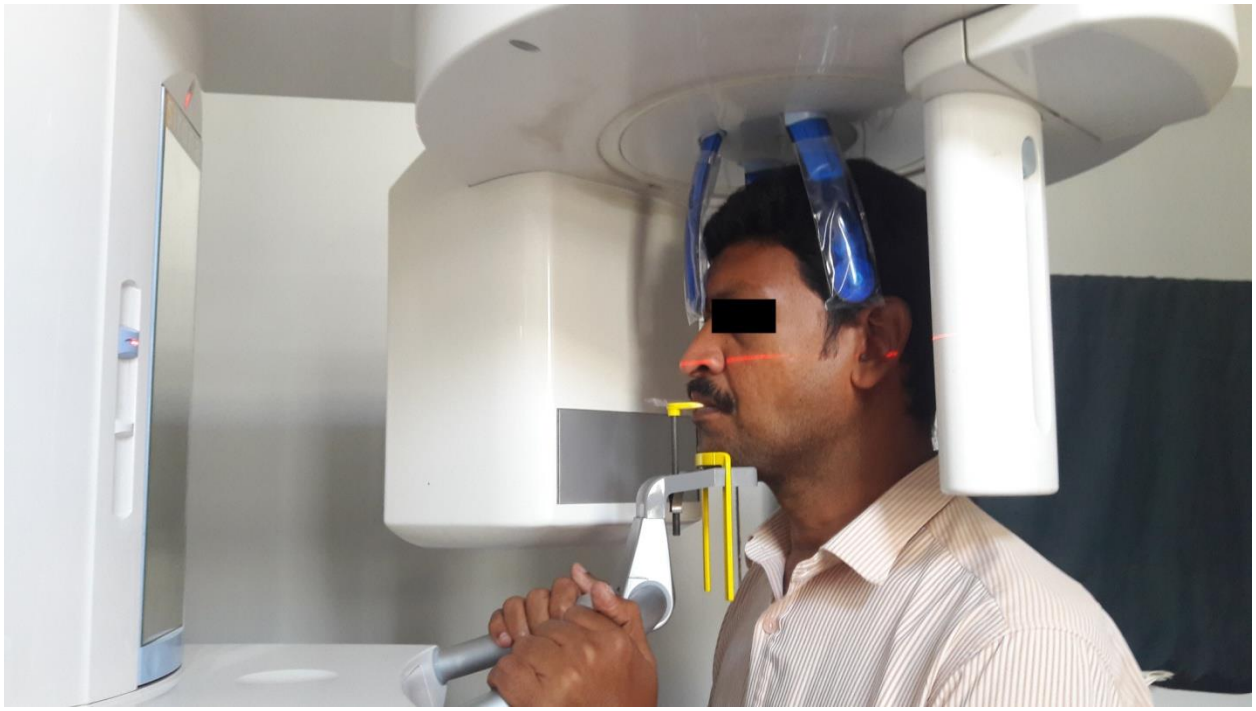

MEASUREMENT OF ALVEOLAR BONE LOSS USING DIGITAL

ORTHOPANTOMOGRAPHY

STATISTICAL ANALYSIS

Data obtained was analyzed using Statistical package for Social Sciences (SPSS) software version 12.0. Intra and intergroup analysis was done using ANOVA and t-test. In the present study, the level of significance (α) was fixed at 5%. ($p \leq 0.05$). Comparison of radiographic dimensions between Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs were performed using ANOVA, *t*-test and Post Hoc Tests.

RESULTS

In our study, 50 Conventional Intraoral periapical radiographs, 50 Digital Radiovisiographs and 50 Digital Orthopantomographs were taken in patients with periodontal disease. Comparison of the radiographic measurements of Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs were performed using t-test, ANOVA and chi-square test. The mean radiographic measurements in Conventional Intraoral periapical radiographs were 6.8980 mm and the mean Digital Radiovisiograph measurements were 7.0340 mm and the mean Digital Orthopantomographic measurements were 7.1120 mm. (Table 1).

It was observed that Conventional Intraoral periapical radiographs evaluated about 0.136 mm lesser bone loss on an average than Digital Radiovisiograph. Digital Orthopantomographs evaluated about 0.078 mm lesser bone loss on an average than Digital Radiovisiograph.

On comparing the radiographic dimensions between the genders, regarding the Conventional Intraoral periapical radiographs, the mean value was 6.5115 in males and 7.3167 in females. In Digital Radiovisiograph, the mean value was 6.6577 in males and 7.4417 in females. In Digital Orthopantomographs, the mean value was 6.7269 in males and 7.5292 in females (Table 2).

The comparison between them by Non-parametric one-way analysis of variance (ANOVA) did not show statistically significant difference between Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs.

We also compared the radiographic dimensions between Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs using Post Hoc Tests. The mean difference between Digital Radiovisiographs and Conventional Intraoral periapical radiographs was 0.13600 and the mean difference between Digital Radiovisiographs and Digital Orthopantomographs was -0.07800. The mean difference between Conventional Intraoral periapical radiographs and Digital Orthopantomographs was -0.21400. The overall results showed the mean statistical difference between Digital Radiovisiographs and Digital Orthopantomographs as 0.005, which is statistically significant. The overall results showed the mean statistical difference between Conventional Intraoral periapical radiographs and Digital Radiovisiographs as 0.005, which is statistically significant. (Table 3)

Table 1 : Dimensions of Interdental Bone loss in Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs.

GROUP_ID	Mean	Standard. Deviation	Significance
RVG	7.0340	1.36705	
IOPA	6.8980	1.36000	0.730
OPG	7.1120	1.36391	
Total	7.0147	1.35738	

GRAPH 1 : Dimensions of Interdental Bone loss in Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs.

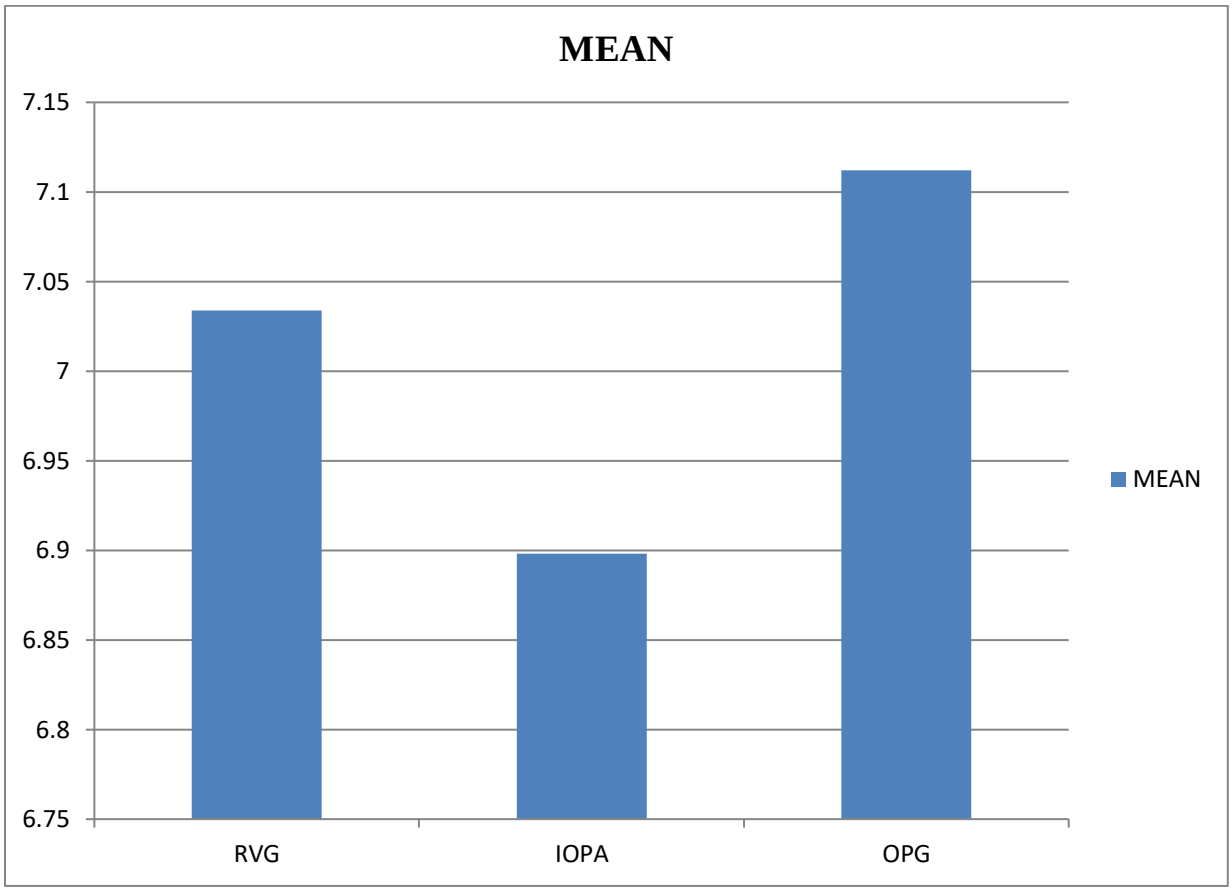

Table 2 : Dimensions of Interdental Bone loss in Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs, among the Gender.

	SEX	N	Mean	Std. Deviation	Significance
RVG	MALE	26	6.6577	1.42525	.255
	FEMALE	24	7.4417	1.19997	
IOPA	MALE	26	6.5115	1.41459	.211
	FEMALE	24	7.3167	1.18896	
OPG	MALE	26	6.7269	1.41804	.247
	FEMALE	24	7.5292	1.19509	

GRAPH 2 : Dimensions of Interdental Bone loss in Conventional Intraoral periapical radiographs, Digital Radiovisiographs and Digital Orthopantomographs, among the Gender.

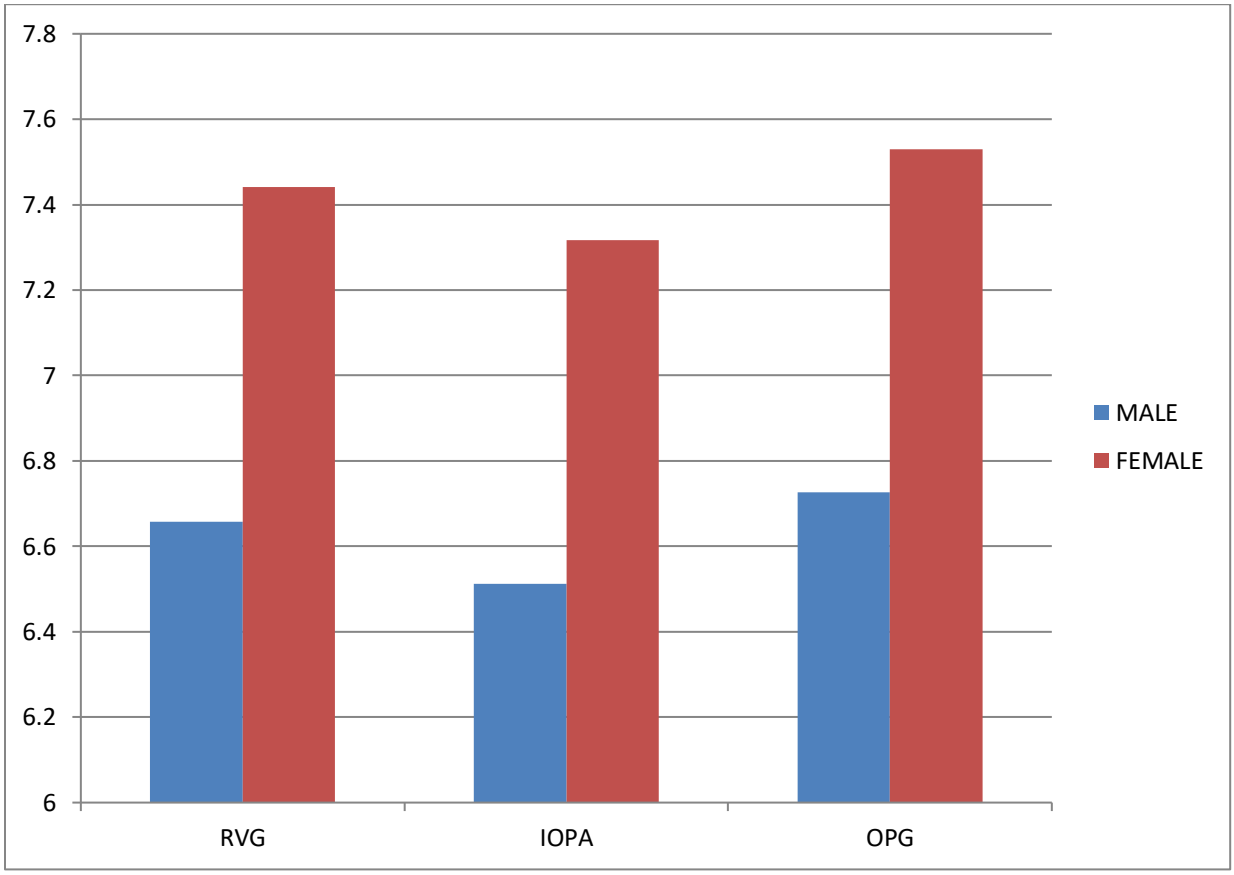

Table 3: Post Hoc Tests:

GROUP_ID	GROUP_ID	MEAN DIFFERENCE
RVG	IOPA	.13600
	OPG	-.07800
IOPA	RVG	-.13600
	OPG	-.21400
OPG	RVG	.07800
	IOPA	.21400

DISCUSSION

Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms, resulting in destruction of the periodontal ligament and alveolar bone. Progressive loss of alveolar bone is the salient feature of periodontal disease. Periodontitis involves progressive loss of alveolar bone around the teeth, if left untreated leads to subsequent loss of teeth. It is characterized by periods of activity in which the periodontal supporting structures are destroyed by the action of chemical mediators of inflammation. Accurate detection of periodontal disease with the use of radiographs helps in diagnosis, treatment and prognosis. The goal of dental radiology is to make an accurate diagnosis using the most effective imaging modality with the lowest radiation possible. [21]

Radiographs provide unique information about the status of the periodontium and a permanent record of the condition of the bone throughout the course of the disease. Radiographs aid the clinician in identifying the extent of destruction of alveolar bone, local contributing factors, and features of the periodontium that influence the prognosis. The diagnosis of periodontal disease is primarily based on clinical examination. The clinical findings of periodontal osseous destruction can be confirmed by radiographic examination.

Radiography is a well established procedure in daily dental practice and is still the most basic and an important diagnostic tool available. Radiographs play an integral role in the assessment of periodontal diseases. Conventional bitewing and intra oral periapical radiographs are commonly used to detect alveolar bone loss associated with periodontal disease. They provide unique information about the status of the periodontium and a permanent record of the bone throughout the course of the disease. [18]

Monitoring bone changes with relatively simple radiographic procedures has proven to be an elusive objective in clinical periodontics. Bone loss has been expressed as a percent of total root length or of total tooth length, and more recently in terms of absolute measurements in millimeters. Low sensitivity for subtle changes is considered to be the major limitation of these conventional interpretations of radiographic images of periodontal bone support.

Along with marginal inflammation, periodontal pocket formation, and attachment loss, alveolar bone loss is a primary feature of periodontitis. The height of the alveolar bone may be evaluated by intrasurgical inspection or, less invasively, by radiographic examination; however, radiographic assessment tends to underestimate the amount of bone loss. Changes of mineralized tissue like alveolar bone may be detected radiographically from consecutive radiographs. [4]

The advent of direct digital imaging has introduced a versatile imaging tool that can be used for a variety of tasks, including detection of alveolar crestal bone defects. The reported prevalence of alveolar bone loss, which is a common dental disease state, may vary depending on the epidemiologic conditions of the study. [5]

In periodontal diseases, the bone destruction pattern is divided into horizontal (even) and oblique (vertical/angular) defects. In the vertical pattern, bone destruction does not proceed in a symmetrical pattern. The severity of bone destruction varies in different parts around the tooth, which explains why the alveolar crest does not correspond to cemento-enamel junction and is not parallel to it. This bone destruction pattern gives rise to bony defects in which the base of the defect is located more apical to the alveolar crest.

Diagnosis and accuracy in determining the exact location, extent and configuration of bony defects are of utmost importance to determine prognosis, to plan treatment and to preserve the teeth in the long run. Because determination of the depth and to some extent, the width of bony defects is an important parameter in the prognosis of treatment, it is important to accurately measure these two parameters on radiographs to develop a correct and appropriate treatment plan. Recently, digital radiography has attracted a lot of attention in determining the depth, width and topography of bony defects and progression of the defect since loss of bone density and height should be

evaluated using an automated instrument to diagnose periodontal lesions and assess the treatment success. [15]

The mean radiographic measurements in conventional intraoral periapical radiographs were 6.8980 mm and the mean digital radiovisiograph measurements were 7.0340 mm and the mean digital orthopantomographic measurements were 7.1120 mm.

It was observed that conventional intraoral periapical radiographs evaluated about 0.136 mm lesser bone loss on an average than digital radiovisiograph. Digital orthopantomographs evaluated about 0.078 mm lesser bone loss on an average than digital radiovisiograph.

The results in our study showed that the mean difference between digital radiovisiographs and conventional intraoral periapical radiographs was 0.13600 and the mean difference between digital radiovisiographs and digital orthopantomographs was -0.07800. The mean difference between conventional intraoral periapical radiographs and digital orthopantomographs was -0.21400. The overall results showed the mean statistical difference between digital radiovisiographs and digital orthopantomographs as 0.005, which is statistically significant. [21]

Karanprakash Singh (2015)[18] conducted a study on comparision between conventional radiography (Intraoral periapical radiographs) and digital radiography using bitewing technique in detecting the depth of alveolar bone loss. They showed that in right

mandible conventional images showed average bone loss of 3.3 mm, while digital images showed 4.0 mm of average bone loss which is statistically significant, which is similar to this study.

On comparing the radiographic dimensions between the genders, regarding the conventional intraoral periapical radiographs, the mean value was 6.5115 in males and 7.3167 in females. In digital radiovisiograph, the mean value was 6.6577 in males and 7.4417 in females. In digital orthopantomographs, the mean value was 6.7269 in males and 7.5292 in females, which is contradictory to the study conducted by Karanprakash Singh (2015)[18.]

SUMMARY:

The present study consisted of 50 samples. Subjects were of both sexes, who were 40-70 years with chronic periodontitis and were attending K.S.R Institute of Dental Science and Research, Tiruchengode, Tamil Nadu, India. Radiographs were taken after obtaining their informed consent. Conventional intraoral periapical radiographs, digital radiovisiographs and digital orthopantamographs were taken for all the patients to measure the interdental alveolar bone loss. Digital radiovisiographs was considered as the gold standard in measuring the interdental alveolar bone loss. Alveolar bone loss was measured from the Cemento Enamel junction to the most apical level of marginal bone. In this study the mean value was compared between the three radiographic techniques and it was revealed the mean value of conventional intraoral periapical radiographs was less when compared to the mean value of digital radiovisiographs, and the mean value of digital orthopantamographs was more when compared to the mean value of digital radiovisiographs. Alveolar bone loss was compared between males and females. Females showed greater alveolar bone loss when compared to males.

CONCLUSION:

Based on the results of this study we conclude that digital radiovisiograph was superior to conventional intraoral periapical radiograph and digital orthopantamograph for the detection of interdental bone loss, due to reduced time and radiation exposure to obtain the same diagnostic information. Digital radiographs showed better results when compared to conventional radiographs in terms of alveolar bone loss as digital radiographs has superior image recording capabilities.

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ANNEXURE-I

INFORMED CONSENT FORM

I ……. hereby declare that I clearly understood the procedures of the study. Also, I declare that I give permission for the above mentioned individual/organization/hospital to do the procedure to the individual/organization listed above.

Signature ……. Date ……..

I have explained the above and answered all questions asked by the participant.

Signature …….. Date ……

ANNEXURE-II

ஒப்புகை வாக்குமூலம்

..... ஆகிய நான் மேற்கூறிய ஆராய்ச்சி படிப்பின் வழிமுறைகளைத் தெளிவாகப் புரிந்து கொண்டேன். மேலும் நான் இந்த ஆராய்ச்சிப் படிப்புக்கான வழிமுறைகளை மேற்கொள்வதற்கும், அதன் பரிசோதனை முடிவுகளை தெரிந்து கொள்ளவும் முழுமையாக அனுமதிக்கிறேன்.

.....

நோயாளியின் கையொப்பம் தேதி.....

நான் மேற்கூறிய ஆராய்ச்சிப் படிப்பிற்கான விதிமுறைகள் மற்றும் அது குறித்த நோயாளியின் சந்தேகங்களையும் தெளிவாக விளக்கியுள்ளேன்.

.....

மருத்துவரின் கையொப்பம் தேதி.....

ANNEXURE-III

INSTITUTIONAL ETHICAL COMMITTEE

KSR INSTITUTE OF DENTAL SCIENCE & RESEARCH
KSR Kalvi Nagar, Tiruchengode-637 215, Tamilnadu.
Phone : 04288-274981, Fax : 04288-274781,
email : ksrdentalcollege@yahoo.com

Ref.: 157/KSRIDSR/EC/2016 **Date : 19.12.2016**

To

Dr.C.Prabhu,
Postgraduate Student,
Dept. of Oral Medicine & Radiology,
KSR Institute of Dental Science & Research,

*****

Your dissertational study titled "COMPARISON OF DIAGNOSTIC ACCURACY OF CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH, DIGITAL RADIOVISIOGRAPH AND DIGITAL ORTHOPANTOMOGRAPH IN DETECTING INTERDENTAL BONE LOSS" presented before the ethical committee on 16th Dec. 2016 has been discussed by the committee members and has been approved.

You are requested to adhere to the ICMR guidelines on Biomedical Research and follow good clinical practice. You are requested to inform the progress of work from time to time and submit a final report on the completion of study.

Signature of Member Secretary
(Dr.G.S.Kumar)

COMPARISON OF DIAGNOSTIC ACCURACY OF CONVENTIONAL INTRAORAL PERIAPICAL RADIOGRAPH, DIGITAL RADIOVISIOGRAPH AND DIGITAL ORTHOPANTOMOGRAPH IN DETECTING INTERDENTAL BONE LOSS

ABSTRACT:

AIM: To compare the diagnostic accuracy of conventional intraoral periapical radiograph, digital radiovisiograph and digital orthopantamograph in detecting interdental alveolar bone loss using digital radiovisiographic measurements as the gold standard.

OBJECTIVES: The main objective of this study is to estimate the diagnostic accuracy of conventional intraoral periapical radiographs, digital radiovisiography and digital orthopantomography in detecting interdental alveolar bone loss using digital radiovisiography measurements as the gold standard and to suggest the most accurate technique to be used in the clinical departments.

MATERIALS AND METHODS: The size of the study sample consisted of 50 patients who were randomly selected from the OPD of Department of Oral Medicine and Radiology. in K.S.R dental college, Tamil Nadu, India, between October 2017 to September 2018, after obtaining their informed consent. Fifty inter-dental sites were considered for the study. The sites included distal surface of the mandibular first molar. Patients having generalized mild to severe chronic periodontitis as assessed by measuring attachment loss and categorized as mild: 1-2 mm, moderate: 3-4 mm, severe: ≥ 5 mm. A series of conventional intraoral periapical radiographs, digital radiovisiographs and digital orthopantamographs were taken. Alveolar bone loss was measured from the Cemento Enamel junction to the most apical level of marginal bone.

RESULTS: It was observed that Conventional Intraoral periapical radiographs evaluated lesser bone loss on an average than Digital Radiovisiograph. Digital Orthopantomographs evaluated lesser bone loss on an average than Digital Radiovisiograph.

CONCLUSION: Based on the results of this study we conclude that digital radiovisiograph was superior to conventional intraoral periapical radiograph and digital orthopantamograph for the detection of interdental bone loss, due to reduced time and radiation exposure to obtain the same diagnostic information. Digital radiographs showed better results when compared to conventional radiographs in terms of alveolar bone loss as digital radiographs has superior image recording capabilities.